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[54] **DEFLECTION FITTING FOR SEAT BELTS OF VEHICLES**

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[30] **Foreign Application Priority Data**

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[51] **Int. Cl.**[7] **B60R 22/00**

[52] **U.S. Cl.** **280/801.1**; 280/805

[58] **Field of Search** 280/801.1, 805, 280/808; 297/464, 468, 482, 483

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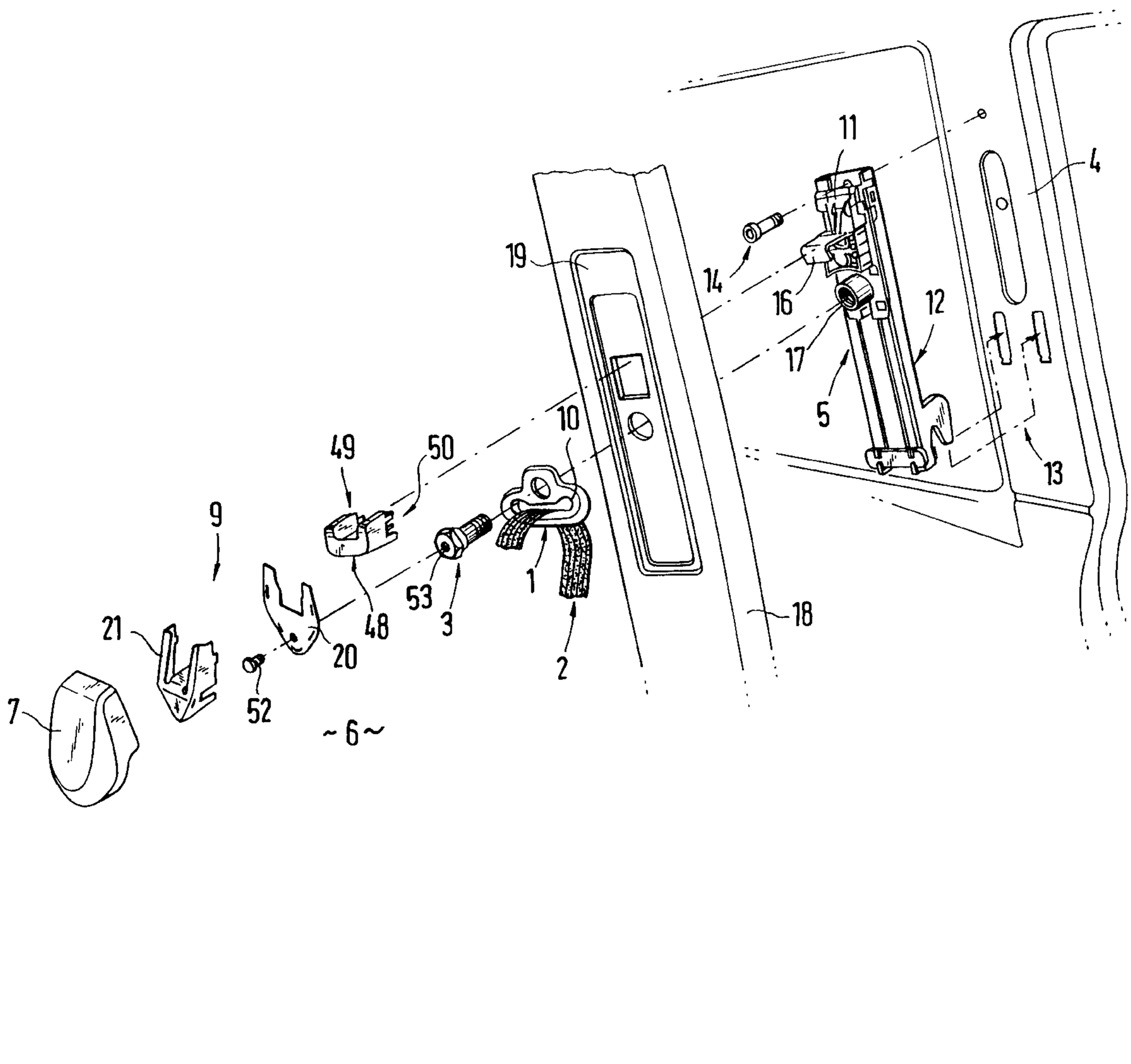
[57] **ABSTRACT**

A deflection fitting for seat belts of vehicles, particularly motor vehicles, is held in position via a fastening screw. A head section of the fastening screw and at least a partial area of the deflection fitting is covered by a cap in the direction of the occupant compartment. In the event of a head impact of a vehicle occupant onto the deflection fitting or onto the head section of the fastening screw, the risk of injury is reduced by a hollow-body-shaped deformation element disposed between the fastening screw and the cap, which is made of thin-wall sheet metal.

12 Claims, 6 Drawing Sheets



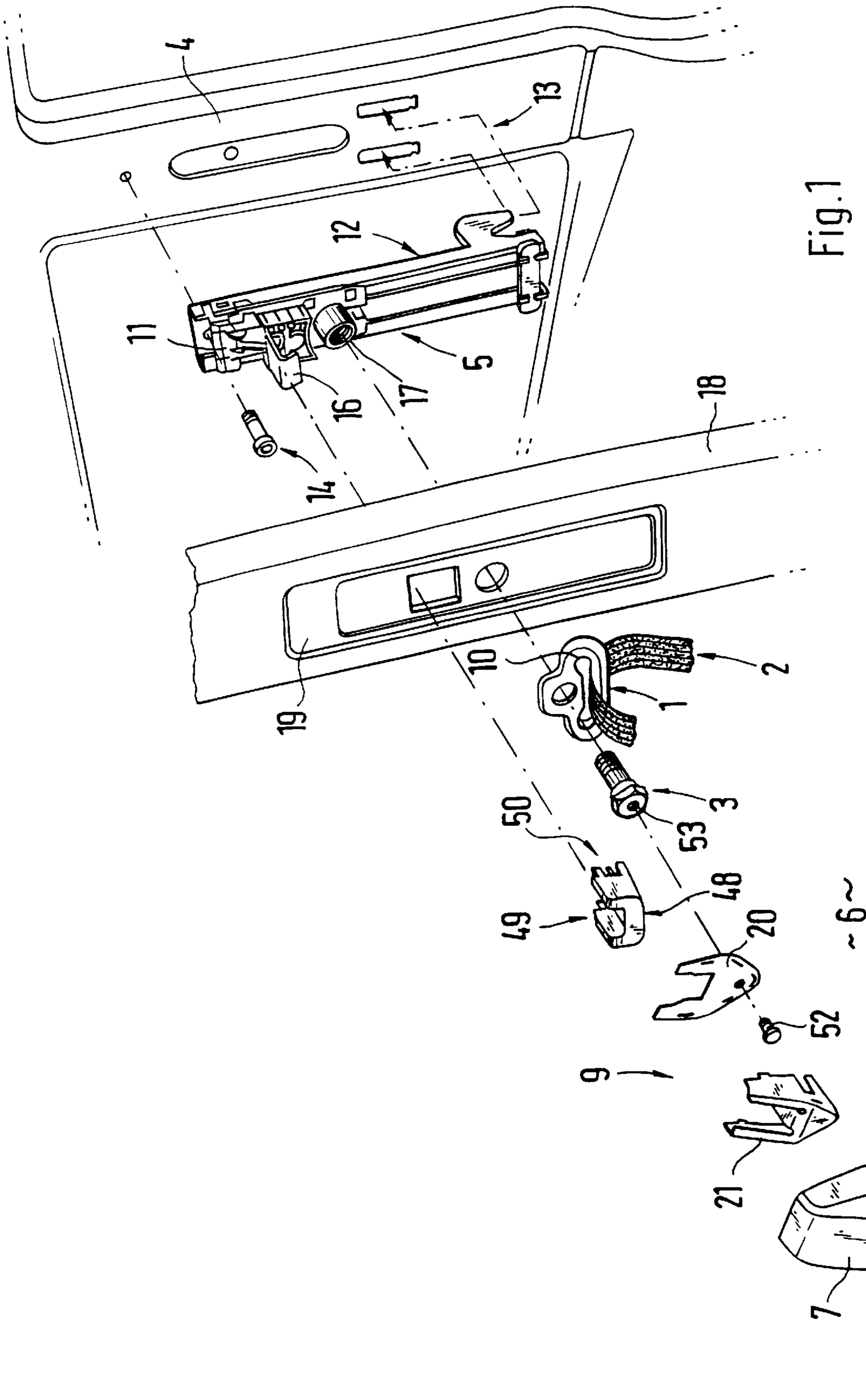


Fig. 1

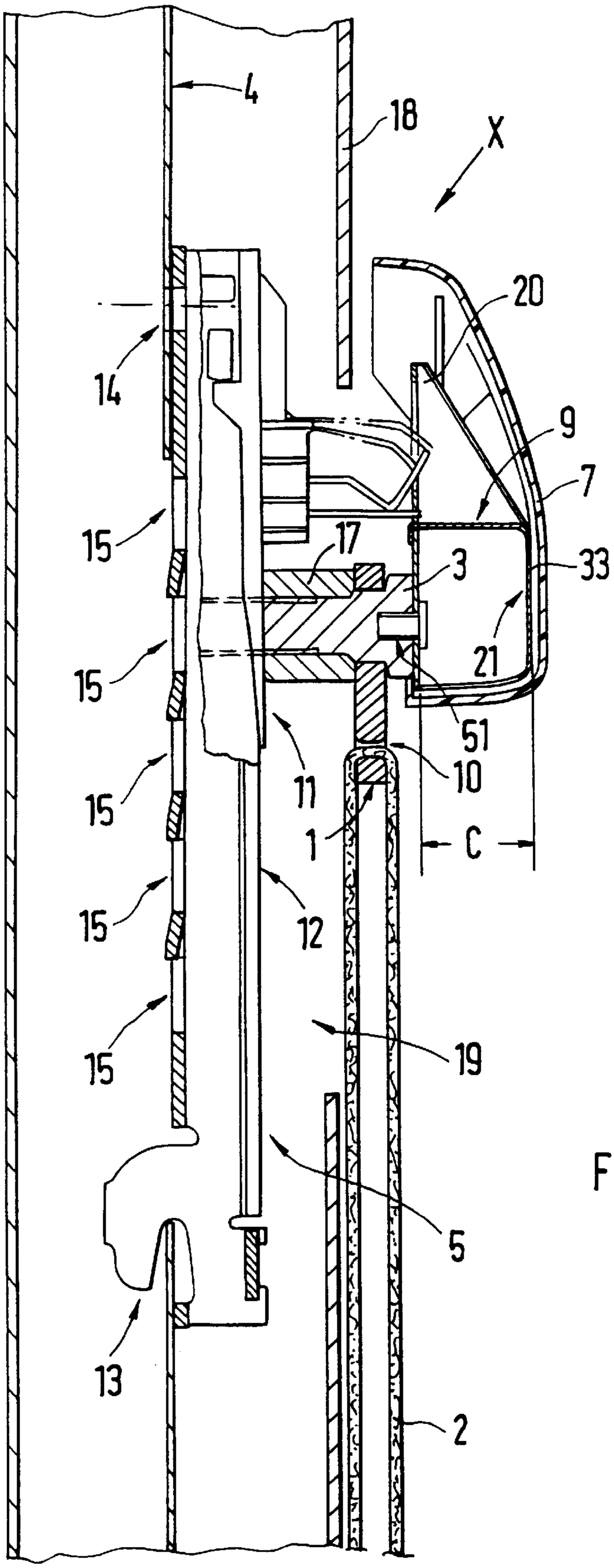


Fig.2

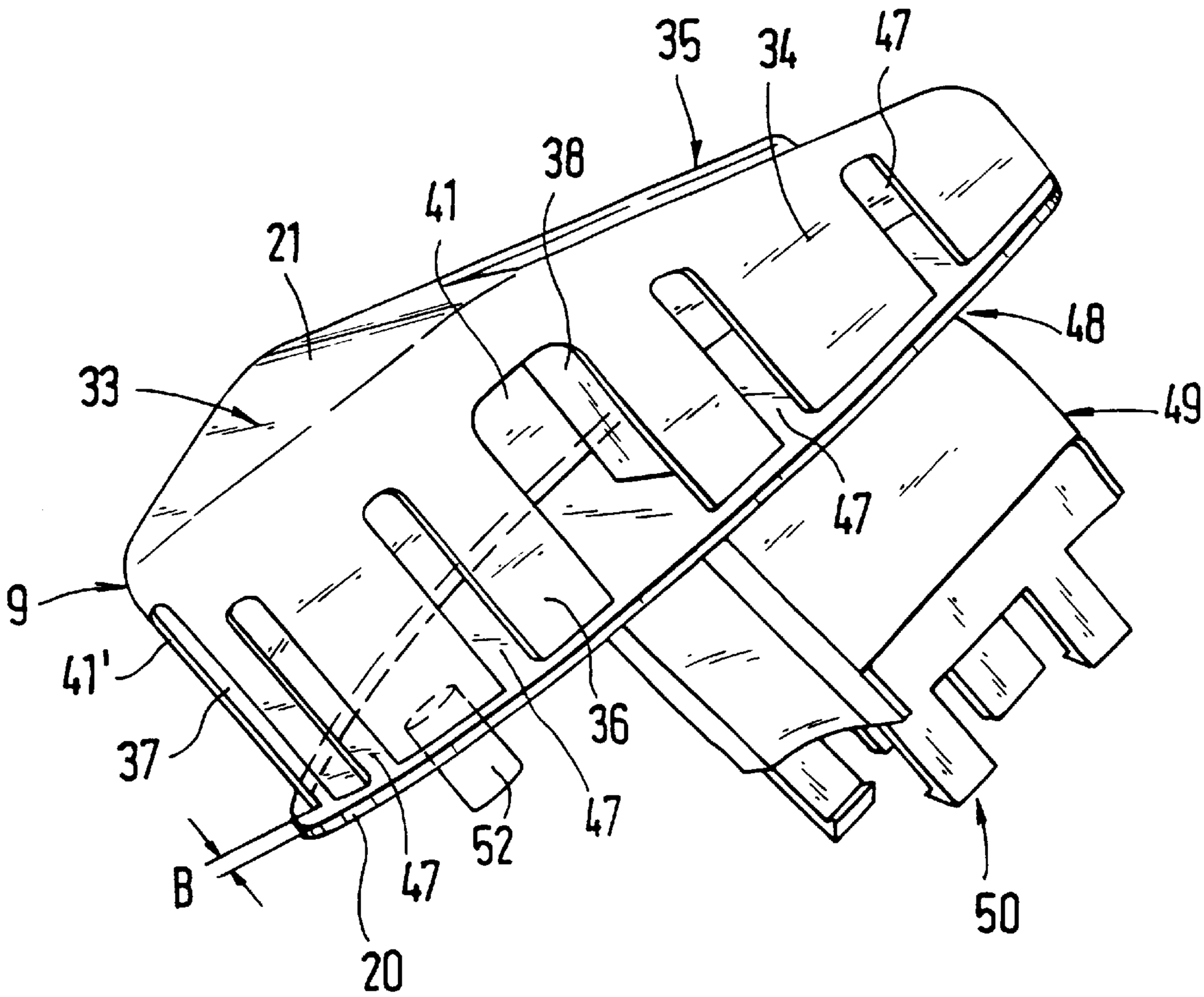


Fig.3

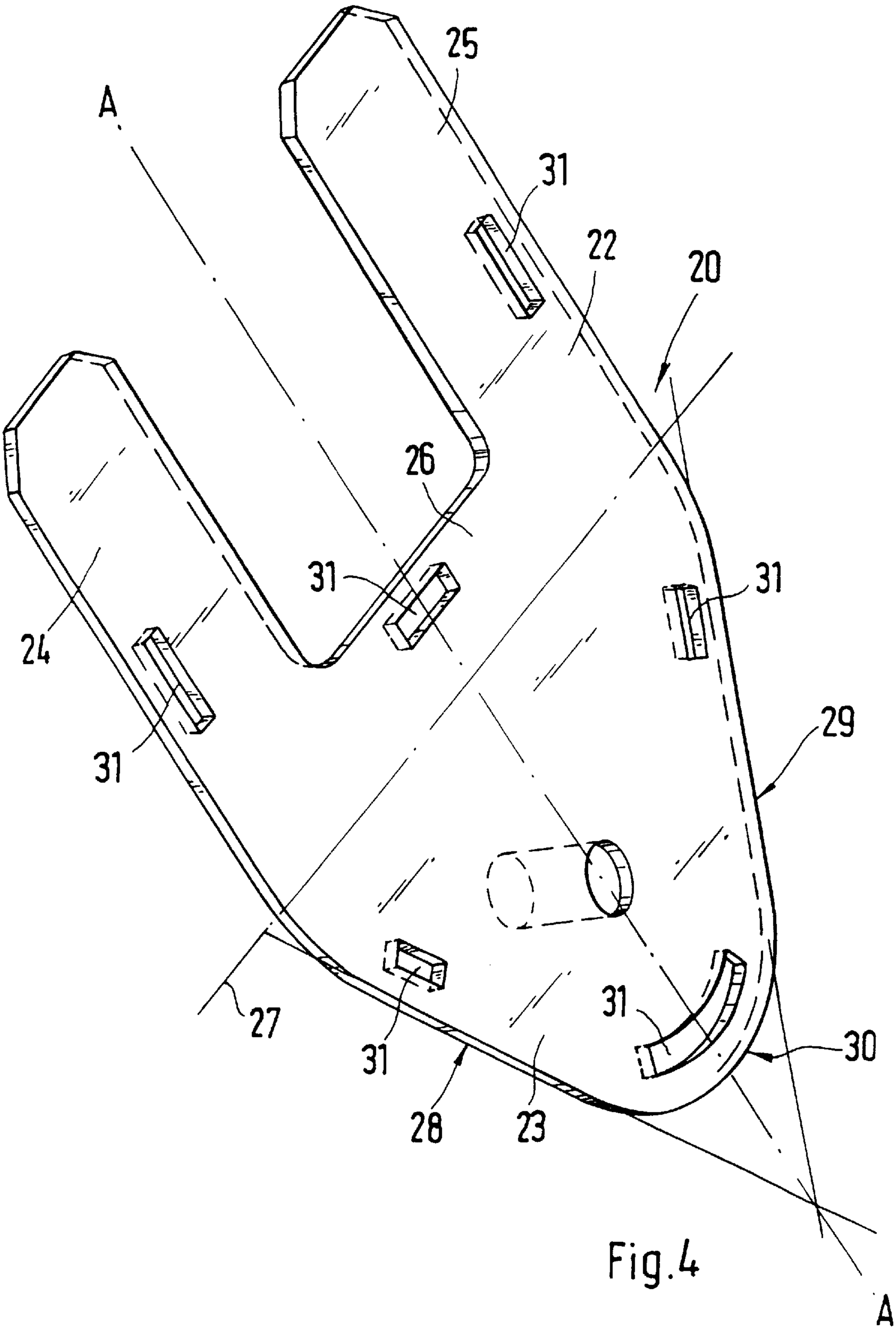


Fig.4

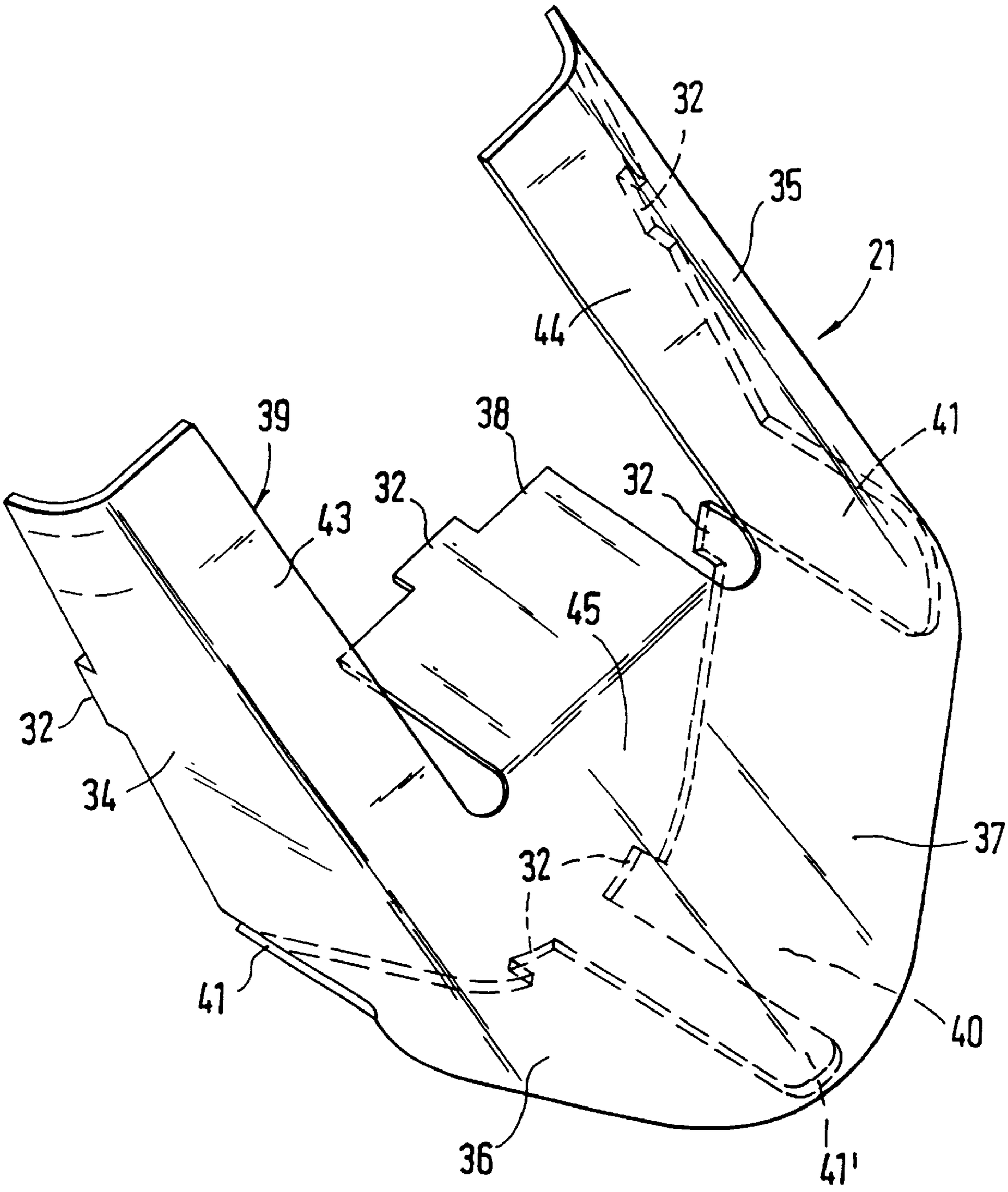


Fig. 5

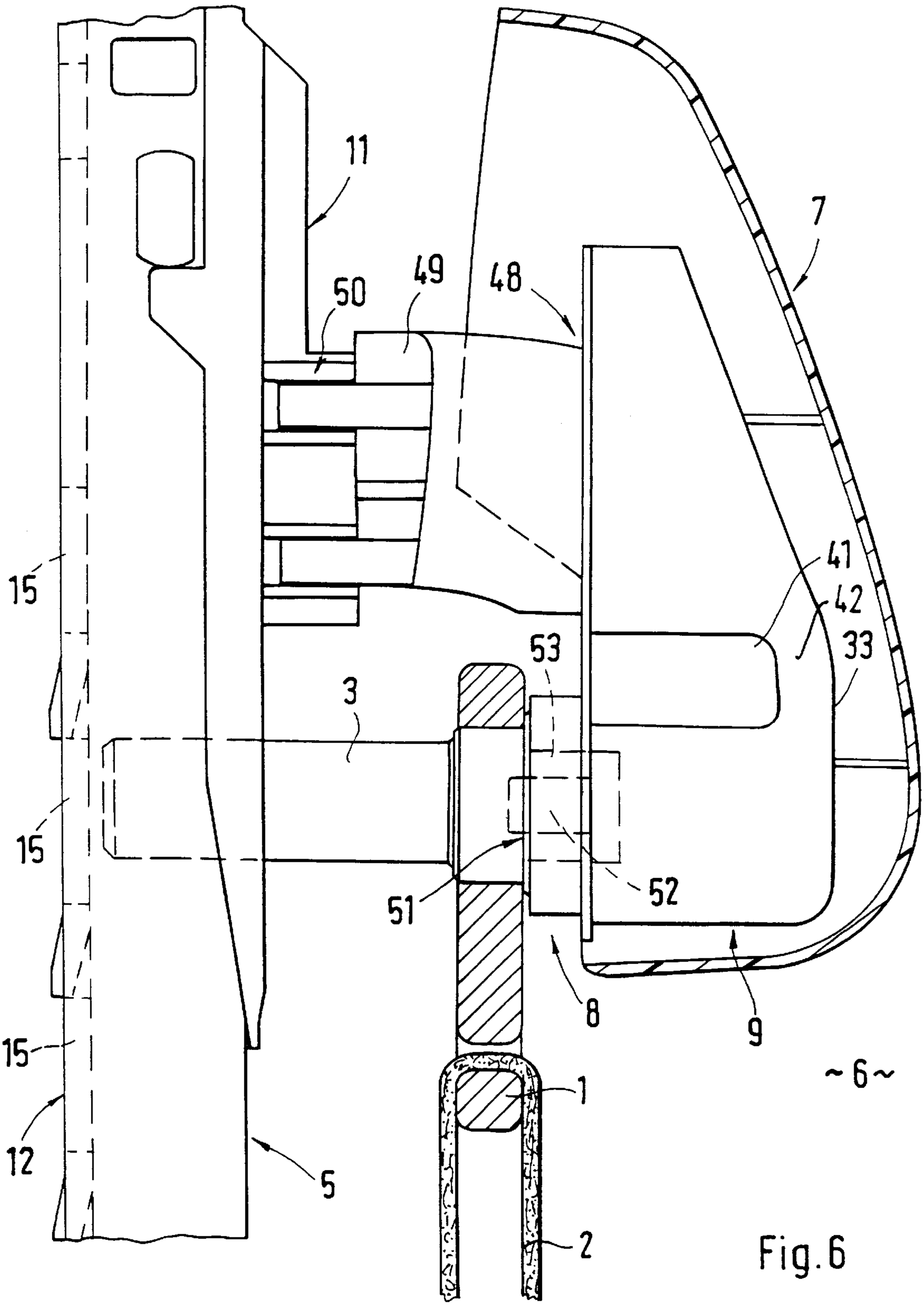


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Fig.6

DEFLECTION FITTING FOR SEAT BELTS OF VEHICLES

BACKGROUND AND SUMMARY OF THE INVENTION

This application claims the priority of German patent 197 45 016.4, filed Oct. 11, 1997, the disclosure of which is expressly incorporated by reference herein.

The invention relates to a deflection fitting for seat belts of vehicles, particularly motor vehicles, which is held in position via a fastening screw, a head section of the fastening screw and at least a partial area of the deflection fitting being covered by a cap toward an occupant compartment.

From German Patent Document DE 33 08 531 C2, a deflection fitting for seat belts of vehicles, particularly motor vehicles, is known which is held in position on the vehicle frame via a fastening screw. The head of the fastening screw is covered by a cap made of plastic which is held in position on a cover plate of the deflection fitting. Such a cap only has the purpose of visually covering the deflection fitting and the fastening screw. However, in the event of an impact of a vehicle occupant's head on the deflection fitting or the head section of the fastening screw, this cap is not suitable for sufficiently absorbing impact energy so that, in the event of a head impact on the deflection fitting, the vehicle occupant may suffer relatively serious head injuries.

For reducing head injuries in the event of a head impact onto the deflection fitting of a seat belt, it is known from French Patent Document FR 26 60 264 A1 to construct a cap manufactured of plastic in an energy-absorbing manner. In the head impact area, the cap extends at a distance from the head of the fastening screw. In the event of a head impact, impact energy is to be absorbed by the compression of the cap. This construction also only results in a relatively low absorption of energy in the event of a head impact.

It is an object of the invention to further develop a deflection fitting of a seat belt, which is held in position via a fastening screw and is covered by a cap situated adjacent thereto, such that, in the event of an impact of a vehicle occupant's head onto the deflection fitting, a relatively high impact energy can be absorbed so that the risk of injury to a vehicle occupant in the event of a head impact is considerably reduced.

This and other objects have been achieved according to the present invention by providing deflection fitting for a seat belt of a motor vehicle, which is held in position via a fastening screw, a head section of the fastening screw and at least a partial area of the deflection fitting being covered by a cap toward an occupant compartment of the vehicle, wherein a hollow deformation element is disposed between the head section of the fastening screw and the cap, said deformation element being made of thin-walled sheet metal.

This and other objects have been achieved according to the present invention by providing deflection fitting for a seat belt of a motor vehicle, the deflection fitting being mounted on a belt adjusting device comprising a holding rail fastened to the vehicle body and an adjusting member displaceably movably arranged on the holding rail, the deflection fitting being fastened on the adjusting member via a fastening screw, wherein a deformation element is held in position by a supporting part on the adjusting member of the belt adjusting device, the deformation element resting in sections on a head section of the fastening screw.

The principal advantages achieved by the invention are that, due to the arrangement of an additional deformation element made of a thin-walled metal sheet between the head of the fastening screw and the cap disposed adjacent thereto, an effective energy absorption is achieved in the event of a head impact.

The hollow-body-type deformation element is made of a thin-walled aluminum sheet or steel plate or of an energy-absorbing structure (such as metal foam) and can be manufactured and mounted in a simple manner. The deformation element can be used in the case of a stationary deflection fitting as well as in the case of a vertically adjustable deflection fitting.

According to certain preferred embodiments, the deformation element is constructed in two parts and is composed of a base plate and of a deformation body placed on it. In the case of a vertically adjustable deflection fitting, the deformation element is fastened via a supporting part on a displaceable adjusting member of the belt level adjusting device. Furthermore, a fixing device for the deformation element is provided between the head of the fastening screw and the deformation element disposed on it. The cap manufactured of plastic is essentially used only for introducing force into the deformation element situated underneath and only to a very small extent for the absorption of energy.

Other objects, advantages and novel feature of the present invention will become apparent from the following detailed description of the invention when considered in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an exploded view of an upright column of a motor vehicle with a belt deflection fitting for a seat belt according to a preferred embodiment of the present invention arranged approximately at the level of a vehicle occupant's shoulder, the belt deflection fitting being mounted on a belt level adjusting device;

FIG. **2** is a vertical sectional view of the body column, the belt deflection fitting and the belt level adjusting device with the deformation element of FIG. **1** in an assembled position;

FIG. **3** is a perspective view of the deformation element;

FIG. **4** is a perspective view of the base plate of the deformation element;

FIG. **5** is a perspective view of the deformation body placed on the base plate; and

FIG. **6** is an enlarged view of a detail area X of FIG. **2**.

DETAILED DESCRIPTION OF THE DRAWINGS

FIG. **1** is an exploded view of a deflection fitting **1** for a seat belt **2** of a vehicle, particularly a motor vehicle, which deflection fitting is arranged approximately at the level of an occupant's shoulder and is fastened by means of a fastening screw **3** either directly on an upright body column **4** or a belt level adjusting device **5** provided on the body column **4**. In the illustrated embodiment, the seat belt **2** is a conventional three-point seat belt. On the side of the deflection fitting facing an occupant compartment **6**, a cap **7** made of plastic which is disposed in front (i.e., in the direction of the occupant compartment) is provided which covers a head section **8** of the fastening screw **3** and at least a partial area of the deflection fitting **1**. In the event of an impact of a vehicle occupant's head onto the deflection fitting **1**, the risk of injury to the vehicle occupant is reduced by a hollow-body-type deformation element **9** made of a thin-walled metal sheet. The hollow-body-type deformation element **9** is disposed between the fastening screw **3** and the cap **7** situated in front, which metal sheet deforms plastically in the

event of head impact and thus absorbs a relatively large amount of impact energy.

In the illustrated embodiment, the deflection fitting **1** has a passage opening **10** for the seat belt **2** and is fastened on an adjusting member **11** of the belt level adjusting device **5**. The belt level adjusting device **5** comprises an elongated holding rail **12** which extends in the vertical direction and which, by way of at least one lower plug-type connection **13** and an upper screw-type connection **14**, can be fastened on the body column **4** (FIG. **2**). On the holding rail **12**, which has an approximately C-shaped profile when viewed from above, the adjusting member **11** is displaceably accommodated, which adjusting member **11** can be fastened in one of several detents **15** arranged above one another via a control element which is swivellably disposed on the adjusting member **11** and is constructed as an angle lever (not shown in further detail). One lever arm of the spring-loaded angle lever engages in one of the detents **15**, whereas the other lever arm is in an operative connection with a swivellable operating element **16** of the belt level adjusting device **5**. By swivelling of the operating element **16**, the angle lever is swivelled and the lever arm facing away from the operating member **16** is disengaged from the detent **15** so that, in this position, the adjusting member **11** can be moved in the vertical direction. In addition, a bush or a plate with an internal thread section is provided on the adjusting member **11**, into which internal thread section the fastening screw **3** can be screwed which carries the deflection fitting **1**.

Between the side of the adjusting member **11** facing the vehicle occupant compartment **6** and the side of the deflection fitting **1** facing away from the head section **8** of the fastening screw **3**, a spacing sleeve **17** is arranged which coaxially surrounds the fastening screw **3**. Toward the occupant compartment **6**, the body column **4** is covered by a covering part **18** which has at least one recess **19** in the area of the belt level adjusting device **5**.

The deformation element **9** made of thin-walled steel plate or aluminum sheet may be constructed in one or several pieces. The illustrated embodiment shows a two-piece construction of the deformation element **9** which is composed of a base plate **20** and of a deformation body **21** placed on the base plate **20**.

According to FIG. **4**, the base plate **20** has a plane construction and is composed of a U-shaped section **22** and of an approximately triangular section **23**. The U-shaped section **22** comprises lateral upright legs **24**, **25** and a transversely extending web **26**. The triangular section **23** adjoins this web **26**. An imaginary line of separation between the U-shaped section **22** and the triangular section **23** has the reference number **27**. Two corner points of the triangular section **23** are situated on this line of separation **27**, whereas the third corner point points downward and extends approximately on an upright center plane A—A of the belt level adjusting device **5**. The two diagonally extending sides **28**, **29** of the triangular section **23** are connected with one another by a radius-shaped transition area **30**. The base plate **20** protrudes by a slight amount (measurement B—see FIG. **3**) beyond the deformation body **21** on the exterior sides of the legs **24**, **25** as well as the sides **28**, **29** and the transition area **30**. The base plate **20** and the deposited deformation body **21** are connected with one another at least locally by way of flanging, welding, gluing or the like. The base plate **20** may also have a different shape than that shown in the illustrated embodiment.

Locally punched-out, oblong openings **31** (see FIG. **4**) are provided on the base plate **20**, through which bent-out rectangular tongues **32** (see FIG. **5**) of the deformation body **21** are guided. Projecting sections of the tongues **32** may be bent on the backside of the base plate **20**. The deformation body **21** comprises an impact surface **33** which is aligned, at least in sections, approximately in parallel and at a distance C with respect to the base plate **20** and which is supported on the base plate **20** by way of side walls **34**, **35**, **36**, **37**, **38** which extend approximately perpendicularly to the base plate **20**. The measurement C defines the deformation path required for the energy absorption. When viewed from he passenger compartment, the impact surface **33** of the deformation body **9** has a similar shape as the base plate **20** situated behind it; that is, it is also composed of an approximately U-shaped section **39** and a triangular section **40**. The triangular section **40** of the impact surface **33** extends approximately in parallel to the base plate **20**, whereas the impact surface **33** extends diagonally upwards on the outside in the area of the U-shaped section **39**. The adjoining side walls **34**, **35**, **36**, **37** are in each case separated from one another by recesses **41**, **41'** which are open in the direction of the base plate **20**. The recesses **41**, **41'** extend approximately to the impact surface **33**; that is, only one narrow web **42** respectively extends between the impact surface **33** and the recesses **41**, **41'**. The deformation body **9** may also have a different shape.

The side walls **34**, **35** are assigned to the U-shaped section **39** of the impact surface **33** and extend from the exterior side of the lateral legs **43**, **44** toward the base plate **20**. The side walls **34**, **35** have a continuously changing height along their longitudinal course.

The side walls **36**, **37** which are assigned to the triangular section **40** have a uniform height along their longitudinal course. The side wall **38** leads away from the connection web **45** of the U-shaped section **39** and is supported on the base plate **20** at its free end. This side wall **38** has a smaller width than the cut-open space which is defined by the interior edge of the legs **24**, **25** or **43**, **44** of the base plate **20** and the impact surface **33**.

For the defined energy absorption, additional weakened areas **47** may be provided on the side walls **34** to **38** of the deformation body **21**, which weakened areas are formed, for example, by slots or the like (see FIG. **3**). The number and size of the weakened areas **47** is empirically determined according to the application.

The deformation element **9** in the illustrated embodiment is placed onto the free end **48** of a supporting part **49** which projects toward the occupant compartment **6** and is fastened to it. For this purpose, the base plate **20** of the deformation element **9** is fixedly connected with the supporting part **49** made of plastic. This can take place by way of gluing, snapping, a plug-type connection or the like. The other end **50** of the supporting part **49**, which is approximately U-shaped in the top view, is fixedly connected with the adjusting member **11** by means of snapping or the like. The supporting part **49** may also be constructed in one piece with the adjusting member **11**. In addition, the deformation element **9** rests in sections on the head section **8** of the fastening screw **3**.

In order to avoid a lateral displacement of the deformation element **9** in the event of an impact shock, a fixing device **51** (FIG. **6**) is provided between the deformation element **9** and the fastening screw **3**. According to a first embodiment, this fixing device **51** comprises a projecting fixing pin **52** which is mounted on the base plate **20** and which engages in a bore **53** arranged at the head section **8** of the fastening screw **3**. In this case, the bore **53** may have a slightly larger diameter

than the outside diameter of the fixing pin **52**. However, the fixing device **51** may also be formed by a screw which, on the head side, is supported on the base plate and which is screwed into a threaded bore of the fastening screw **3** for the deflection fitting **1**.

The cap **7** made of plastic (for example, PC, ABS) can be fastened, for example, by way of snapping, to the deformation element **9**.

The recessed areas of the base plate **20** and of the deformation body **21** between the lateral legs **24**, **25** or **43**, **44** of the U-shaped sections **22** or **39** are used for receiving the swivellable operating member **16** of the belt level adjusting device **5**. The other area of the operating member **16** is adapted to the shape of the cap **7** so that, when the belt level adjusting device **5** is locked, the operating member **16** extends flush with the surface with respect to the cap **7**.

The foregoing disclosure has been set forth merely to illustrate the invention and is not intended to be limiting. Since modifications of the disclosed embodiments incorporating the spirit and substance of the invention may occur to persons skilled in the art, the invention should be construed to include everything within the scope of the appended claims and equivalents thereof.

What is claimed is:

1. Deflection fitting for a seat belt of a motor vehicle, which is held in position via a fastening screw, a head section of the fastening screw and at least a partial area of the deflection fitting being covered by a cap toward an occupant compartment of the vehicle, wherein a hollow deformation element is disposed between the head section of the fastening screw and the cap, said deformation element being made of thin-walled sheet metal, and

wherein the deformation element comprises a base plate and a deformation body placed on the base plate, said base plate in use being disposed between the head section of the screw and the cap.

2. Deflection fitting according to claim **1**, wherein the deformation element is constructed in one piece.

3. Deflection fitting according to claim **1**, wherein the deformation element is constructed in several pieces.

4. Deflection fitting according to claim **1**, wherein the base plate and the deformation body are connected with one another by at least one of a flanged connection, a welded connection, and an adhesive connection.

5. Deflection fitting according to claim **1**, wherein the cap can be fastened to the deformation element.

6. Deflection fitting according to claim **1**, wherein the deformation body has an impact surface which, at least in sections, is aligned approximately in parallel to the base plate and which is supported on the base plate by way of side walls which extend approximately perpendicularly with respect to the base plate.

7. Deflection fitting according to claim **6**, wherein recesses are provided between adjacent ones of the side walls.

8. Deflection fitting according to claim **6**, wherein locally defined weakened areas are provided on at least one of the side walls.

9. Deflection fitting for a seat belt of a motor vehicle, the deflection fitting being mounted on a belt adjusting device comprising a holding rail fastened to the vehicle body and an adjusting member displaceably movably arranged on the holding rail, the deflection fitting being fastened on the adjusting member via a fastening screw, wherein a deformation element is held in position by a supporting part on the adjusting member of the belt adjusting device, the deformation element resting in sections on a head section of the fastening screw.

10. Deflection fitting according to claim **9**, wherein the deformation element interacts with the head section of the fastening screw via a fixing device preventing a lateral displacement.

11. Deflection fitting according to claim **10**, wherein the deformation element includes a base plate, a projecting fixing pin being mounted on the base plate and engaging in a bore arranged on the head section of the fastening screw.

12. Deflection fitting according to claim **9**, wherein the deformation element comprises a base plate and a deformation body placed on the base plate,

respective cut-open areas being constructed on the base plate, on the deformation body and on the cap,

an operating element, which is swivellably disposed on the adjusting member, penetrating the cut-open areas of the base plate and of the deformation body for adjusting the belt level adjusting device.

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